MODIFICATIONS TO THE PUBLIC TRANSIT BUS FLEET RULE AND NEW INTERIM CERTIFICATION PROCEDURES FOR HEAVY-DUTY HYBRID-ELECTRIC VEHICLES

Public Hearing

October 24, 2002

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

Air Resources Board

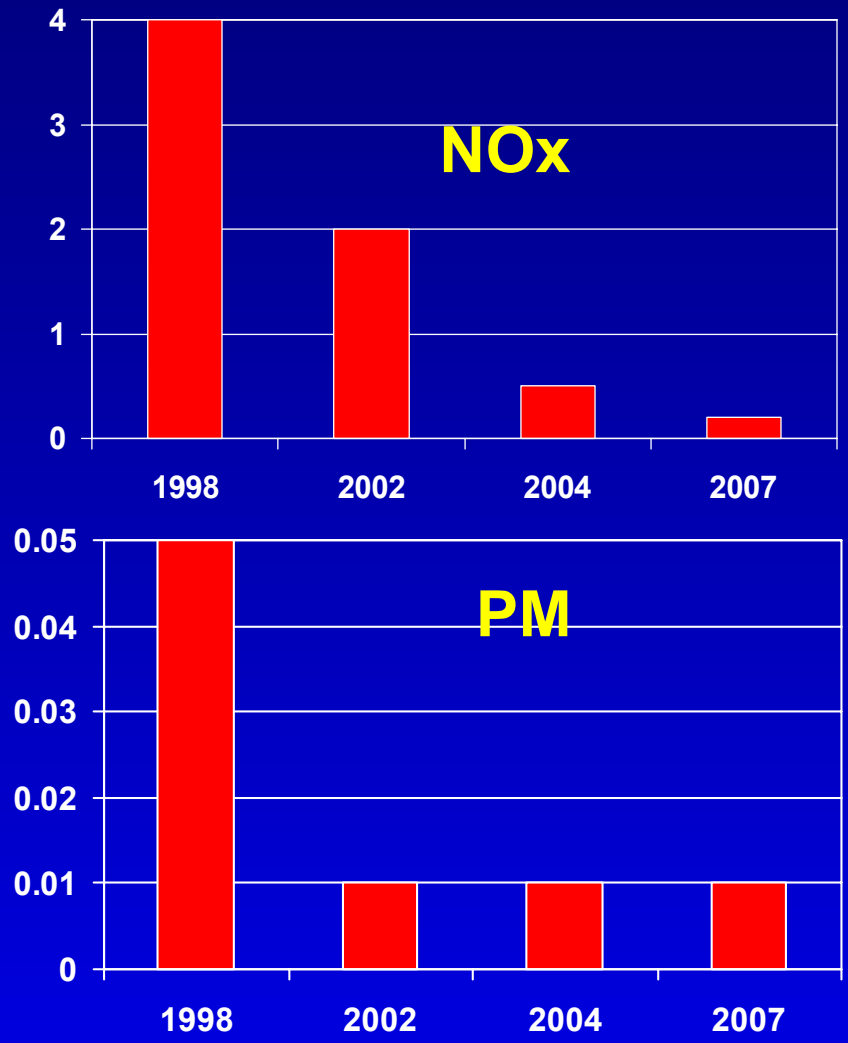
Today's Presentation

- Background
- Proposed Fleet Rule Amendments
- Proposed Interim Certification Procedure for Hybrid-Electric Vehicles in the Urban Bus and Heavy-Duty Vehicle Classes
- Conclusions & Recommendations

Background

- Public Transit Bus Fleet Rule and Emission Standards for New Urban Buses adopted February 2000
- Goal is to reduce both NO_x and PM through:
  - New technology forcing standards, and
  - A fleet rule designed to promote advanced technology

Urban Transit Bus Standards



- Urban bus standards set for engine manufacturers
- NO_X and PM standards lowered significantly
- Goal is to move toward Zero Emission vehicles in all areas

Implementation Status

- ✓ 1/31/01: Fuel path selected
- ✓ 7/1/02: Started ultra low sulfur fuel
  - All but 4 small transit agencies
- ✓ 10/1/02: 4.8 g/bhp-hr NO_x fleet average
  - All but one transit agency, notice of violation
- 12/31/02: Alt. NO_X strategy demo on schedule

Implementation Status (continued)

- 1/1/03: PM Retrofits
  - No devices verified for engines older than 1994, and some 1994 and newer
  - Board directed staff to modify PM retrofit program
- 7/03: Zero Emission Bus demo
- 7/08: Zero Emission Bus purchases

Current PM Retrofit Schedule 2003 - 2009

Tiers	Fuel Path	2003	2004	2005	2006	2007	2008	2009
Tier 1 Pre-1991	Diesel	100 %						
	Alt. Fuel	100%						
Tier 2 1991-1995	Diesel	50%	100%					
	Alt. Fuel	20%	75%	100%				
Tier 3 1996-2002	Diesel			20%	75%	100%		
	Alt. Fuel					20%	75%	100%

Note: Percentages of buses retrofitted by January 1 of every year.

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Overview of Staff's Proposal

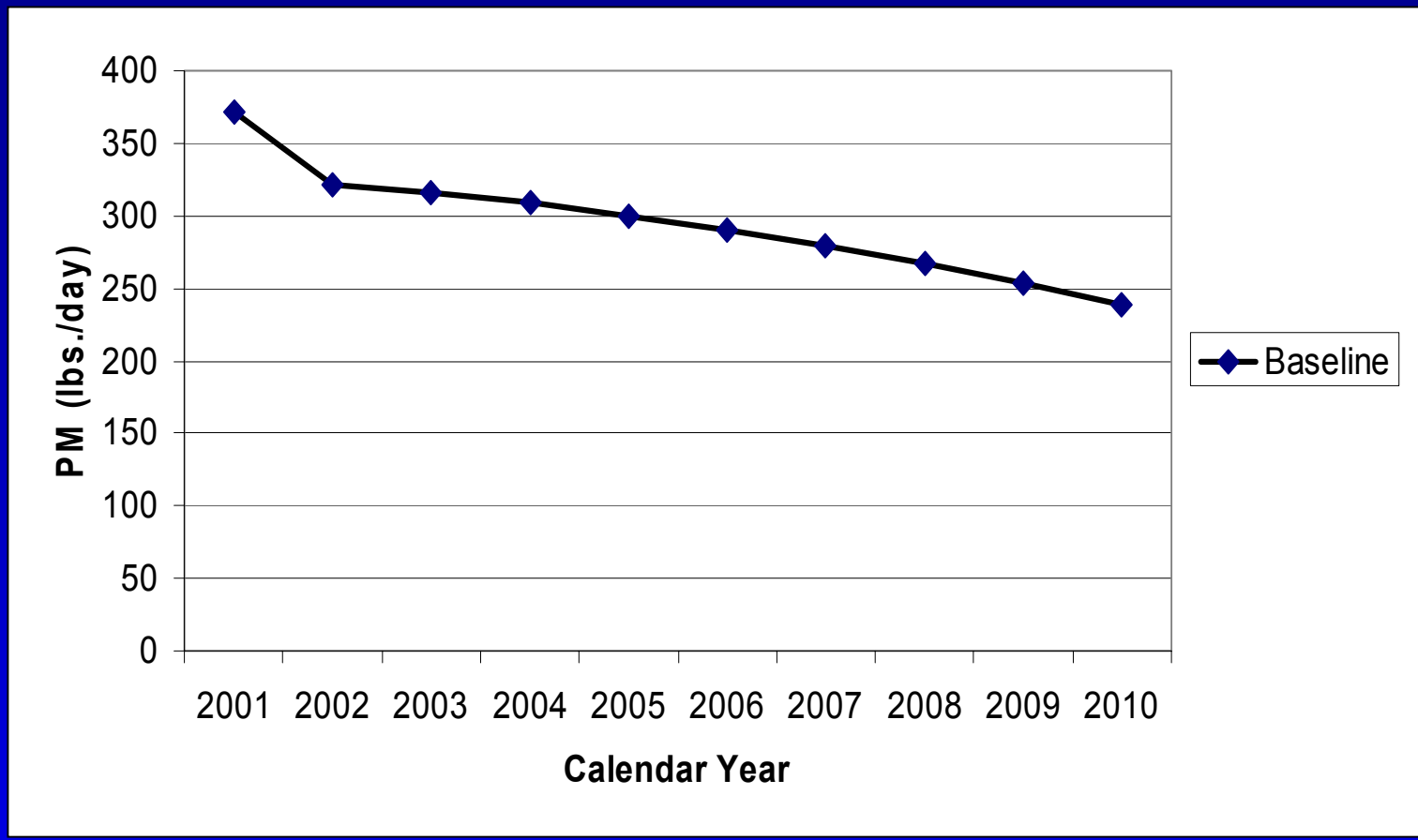
- Diesel PM Emission Reduction Proposal
- Fuel Path Change
- Alternative Fuel Bus Purchase Provision
- Compliance extension request
- Modification to definitions
- Replace PM retrofit certification procedures
- Other

Diesel PM Emission Reduction Proposal

Fuel Path	Percent Diesel PM Reduction Compliance year as of January 1st						
	2003	2004	2005	2006	2007	2008	2009
Diesel	0 %	40 %	60 %		85 %		
Alternative Fuel	0 %	20 %	40 %		60 %		85 %

Note: Percentage reduction based on transit agency's total diesel PM emission baseline calculated for January 1, 2002.

Current Versus Proposed Diesel PM Emissions



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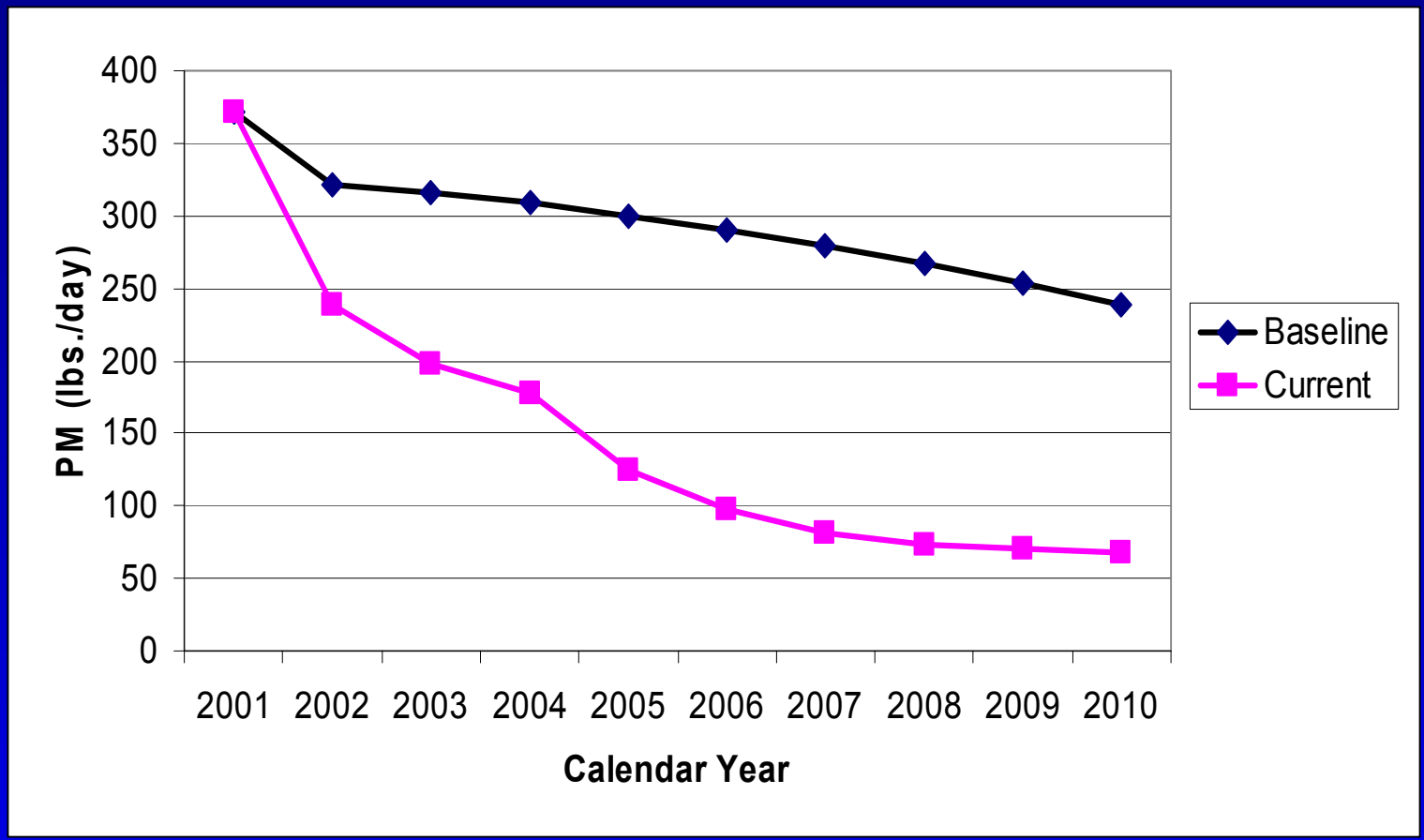
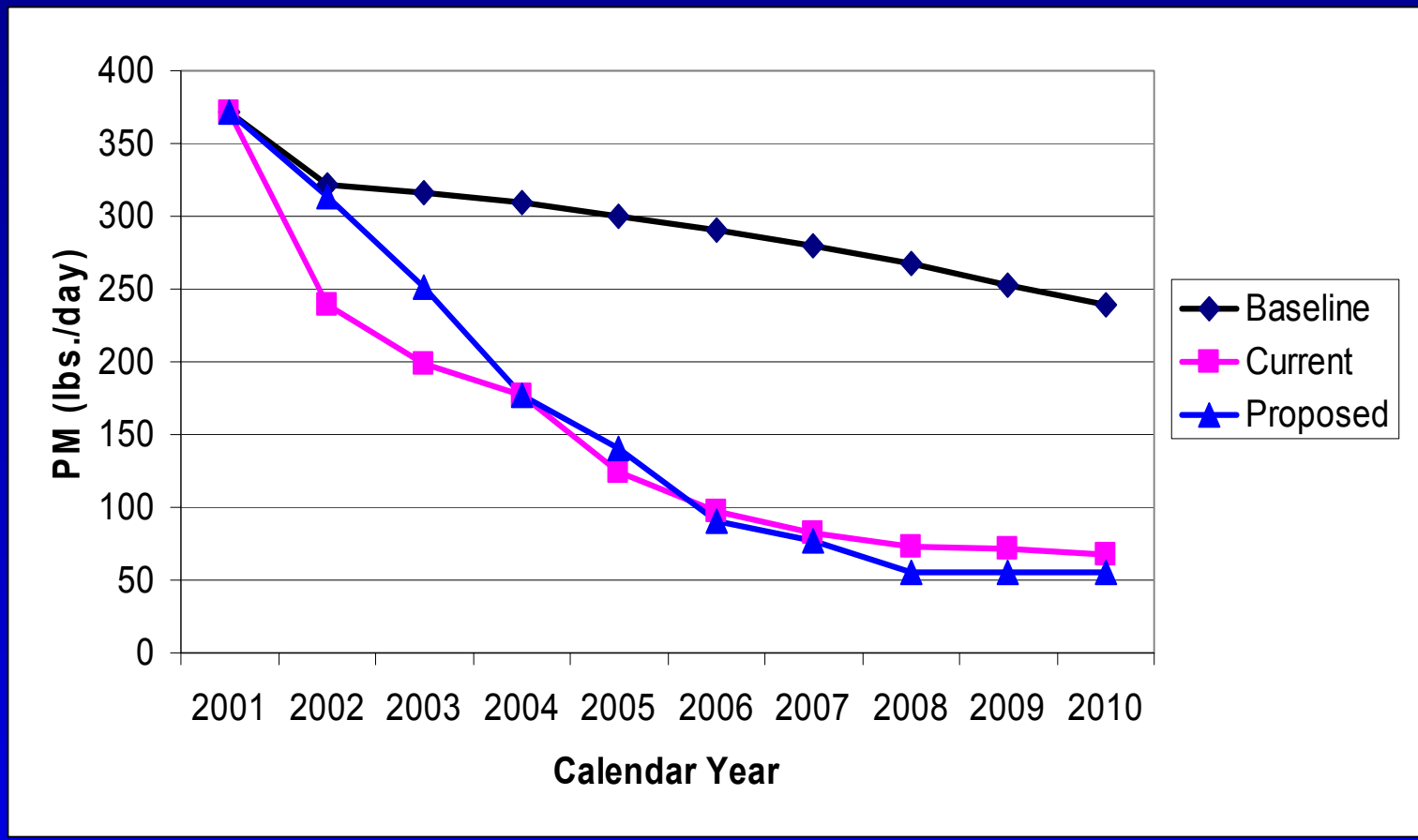


Current Versus Proposed Diesel PM Emissions



Cost-Effectiveness ($/lb)

- Proposed amendments - average $25 per pound (range $11 - $45)
- Original rulemaking - average $18 per pound

New PM Proposal Flexible

- Ensures that every diesel fleet will reduce diesel PM by 85% as of 2007 and 2009
  - Consistent with February 2000 Rulemaking
- Options available to transit agencies
  - Replacement with newer buses
  - Repower with cleaner engines
  - Retire
  - Retrofit

Fuel Path Change Background

- Benefits for selecting alternative fuel path:
  - Same NO_X/more PM benefits than diesel path
  - Later compliance with PM retrofit schedule
  - No ZEB demonstration
  - ZEB purchase requirement 2 years later
- Statewide change from diesel path to alternative fuel path impacts anticipated benefits

Fuel Path Change Evaluation

- Fuel Path Change Statewide Not Necessary
  - All transit agencies solicited
  - Only transit agencies in SCAQMD responded
- Very little impact if allowed in SCAQMD
  - Rule 1192 - Alternative fuel purchase required since July 1, 2001
  - Seven transit agencies on diesel path

Fuel Path Change Requirements

- Applicable to transit agencies in the SCAQMD
- Diesel to alternative fuel ONLY
- Change declared by 1/31/04
  - Coincides with scheduled reporting
  - After final rule approval
- Letter of intent must certify compliance with fleet rule provisions

Alternative Fuel Bus Purchase Current Provision

- Diesel path: 2004 - 2006 MY engines must meet 0.5 g/bhp-hr NO_X
- Transit Agencies with Alternative NO_X Exemption approval may purchase 2.5 g/bhp-hr NO_X+ NMHC engines
- No alternative fuel engine projected to meet 0.5 g/bhp-hr NO_X by 2004

Alternative Fuel Bus Purchase Proposed Revision

- Allow alternative fuel engines on the diesel path at 2.5 g/bhp-hr NO_X+NMHC
  - Encourages transit agencies on the diesel path to purchase alternative-fueled bus engines

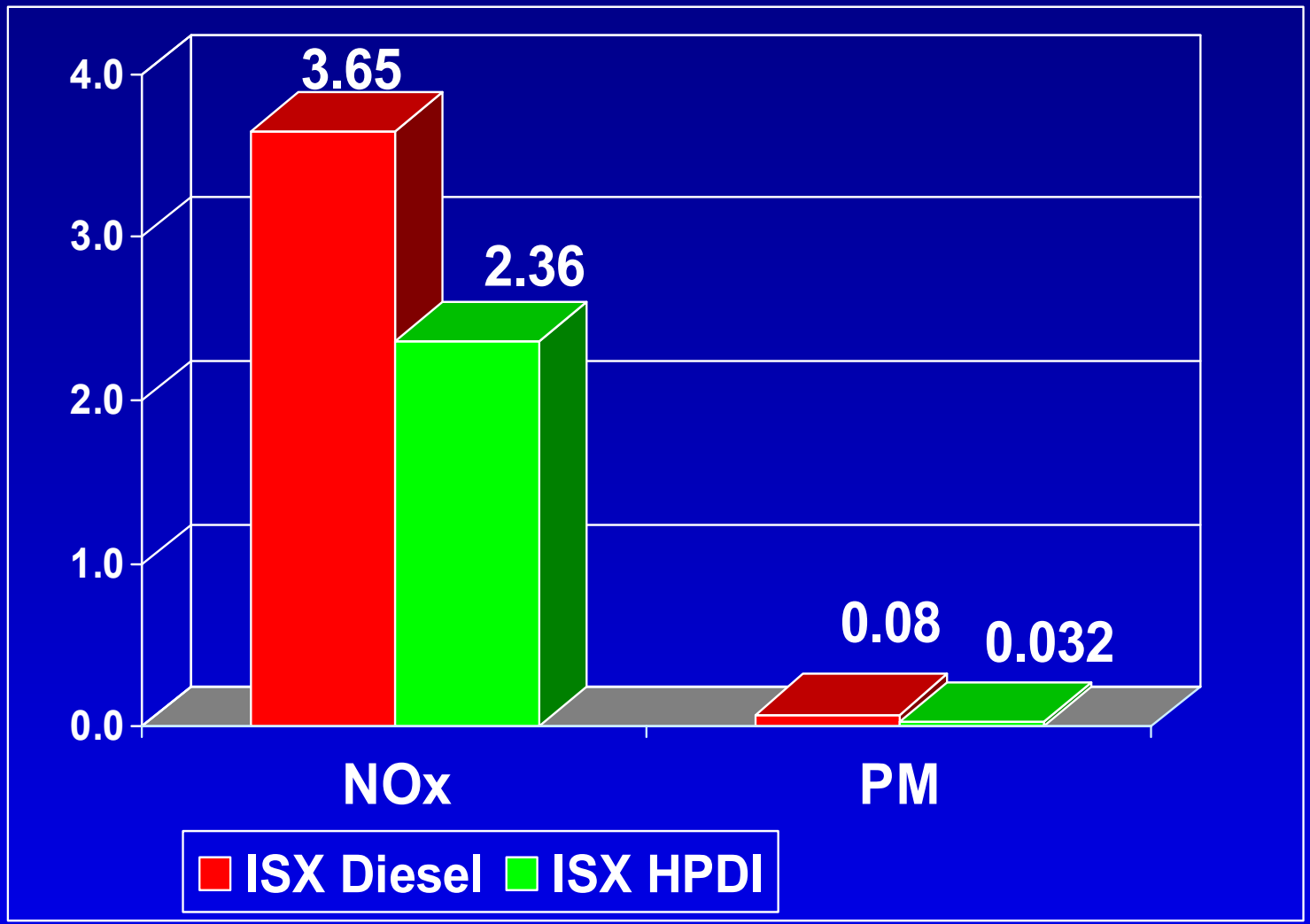
Compliance Extension for Small Transit Agencies

- Fleet size less than 20 buses
- Financial hardship implementation delay
  - Apply at least 30 days prior to the implementation date
  - Provide documentation as specified
  - Approval by Executive Officer 90 days after receipt
  - Applicant responsible for compliance until application approved

Heavy-Duty Pilot Ignition Engines 15 Day Change

- Retain current alternative fuel definition
- Allow engines that use diesel as a pilot ignition source only
  - Natural gas is the primary fuel, diesel is less than 10 percent of total fuel usage
  - Engine cannot idle or operate solely on diesel
- Engine may be certified to same levels as alternative fuel engines

Emissions Comparison
(g/bhp-hr)



Other Changes

- Modify ultra low sulfur requirement
  - Allow any fuel verified by EO as a diesel emission control strategy
- Update certification procedures for retrofits with new procedure approved in May 2002

Other Changes (continued)

- Modify the definition of “Active Fleet”
  - indicates buses operated by or under contract to transit agency
- Two new definitions
  - Emergency Contingency
  - Spare Bus
- Reporting Requirements

Proposed Interim Certification Procedure for Hybrid-Electric Vehicles Used in the Urban Bus and Heavy-Duty Vehicle Classes

Hybrid-Electric Buses (HEBs)

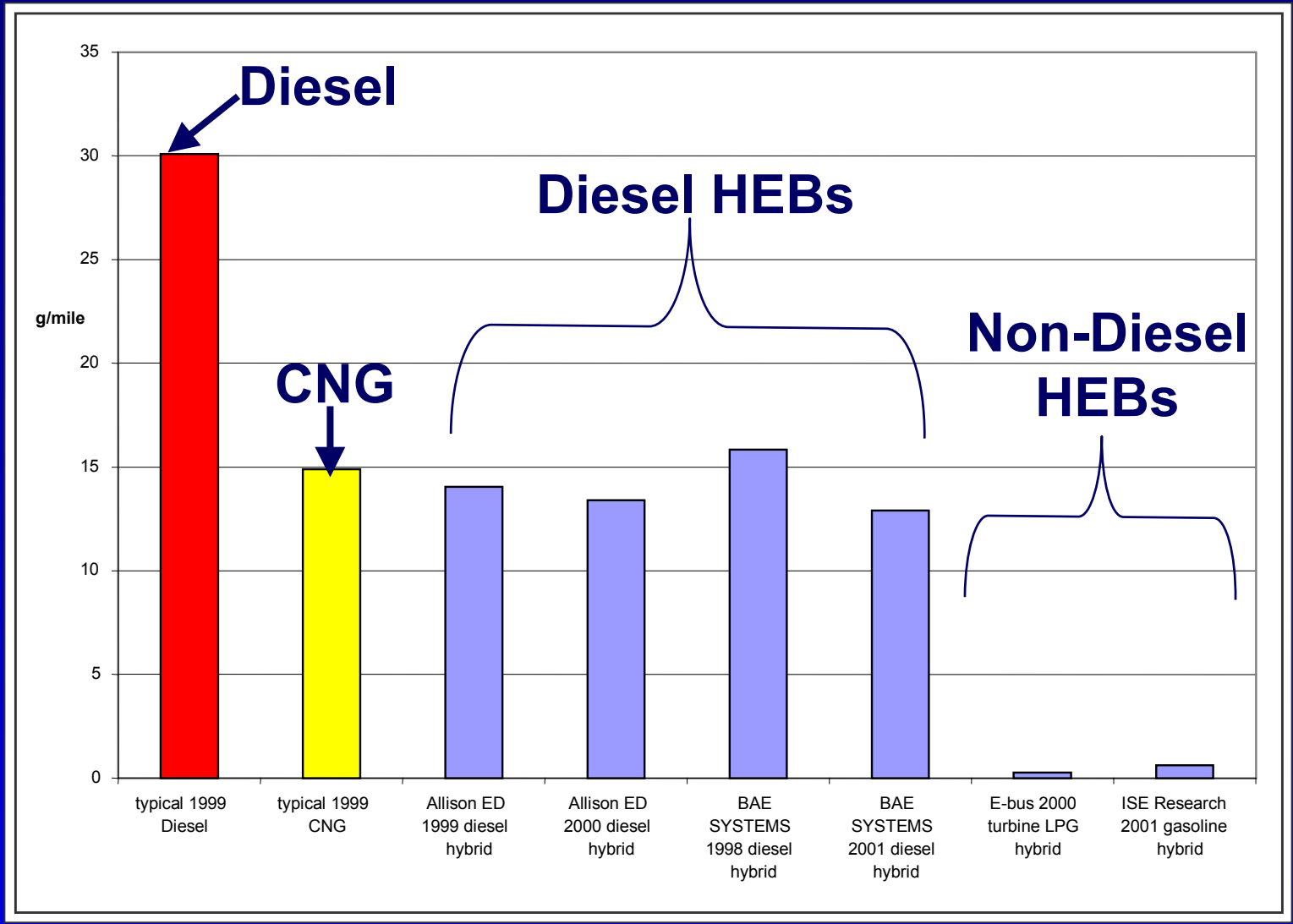
- Urban buses: frequent stop and go
- HEBs reduce high polluting episodes
- HEBs use Two motive power sources
  - Battery pack/ultra-capacitors & electric motor
  - APU (internal combustion engine, microturbine)

Types of HEBs

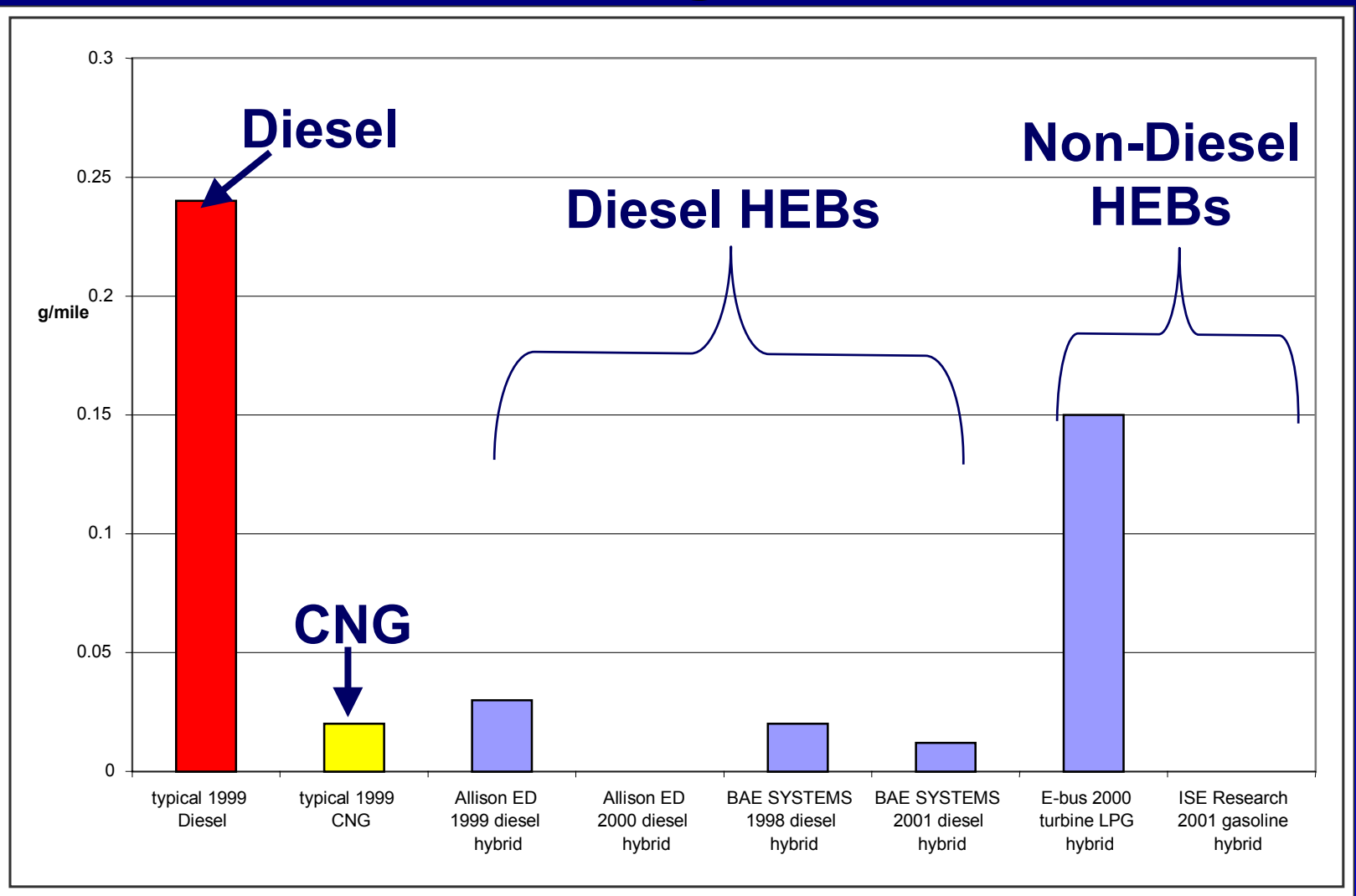
Steps in Developing Proposed Procedure

- Staff worked closely with U.S. EPA and stakeholders
- Recommended practice approved by SAE in April 2002
- Tested several hybrid electric buses following SAE J2711

NOx Testing Results



PM Testing Results



Proposed Interim Certification Procedure

- Procedure is Quantifiable
  - Incorporates a chassis test procedure
  - SAE J2711 modified for clarity
  - Test results correlated to g/bhp-hr cert.
- Procedure is Enforceable, APU and Hybrid-electric System...
  - Would be ARB-certified and labeled
  - Would have useful life, durability, warranty, record keeping, and information requirements

Proposed Interim Certification Procedure (continued)

- Procedure is flexible, manufacturers may:
  - Follow current engine certification
  - Claim a 25% reduction, in lieu of testing
  - Case-by-case certification for emerging technology
  - Split certification

Responsibility

	Current Requirements	Proposed for HEBs - Interim		
	Engine Manufacturer	Two Party Responsibility		Single Party Responsibility
		Engine Manufacturer	Hybrid-Electric System Manufacturer	
NOx+NMHC/PM Certification Standard of APU	2.5/0.01 g/bhp-hr	2.5/0.01	Reduced level	2.5/0.01
Useful Life	10 years, 290,000 mi.	5 yrs, 150,000 mi.	5 yrs, 150,000 mi.	5 years, 150,000 mi.
Durability Demonstration	For Full Useful Life	Under 50 Exempt	Under 50 Exempt	Under 50 Exempt
Warranty	5 years, 100,000 mi.	Existing	Existing	Existing

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Conclusions & Recommendations

- Proposed amendments are flexible and necessary to achieve PM reductions
- Interim certification procedure for hybrid-electric vehicles is necessary to promote new promising technology
- Recommend Board approval of amendments and interim procedure